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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/701,181	11/05/2003	Greg Parker	553-78	6375

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EXAMINER

PAK, SUNG H

ART UNIT PAPER NUMBER

2874

DATE MAILED: 04/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/701,181	PARKER ET AL.	
	Examiner	Art Unit	
	Sung H. Pak	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11/05/2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>0704</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

Applicant's information disclosure statement, filed 7/21/2004 has been considered by the examiner.

Specification

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a **single paragraph** on a separate sheet **within the range of 50 to 150 words**. It is important that the abstract **not exceed** 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract of the disclosure is objected to because it is more than a single paragraph and exceeds 150 words. Correction is required. See MPEP § 608.01(b).

The disclosure is objected to because of the following informalities: The specification uses the symbol " \exists " throughout the disclosure (for example, " $n_{\text{core}} > n_{\text{rods}} \exists n_{\text{cladding}}$ "). However, symbol " \exists " is not a widely accepted symbol for inequality. While the applicant may be his or her own lexicographer, it is strongly urged that a widely accepted form of inequality symbol " \geq " should be used instead.

Appropriate correction is required.

Claim Objections

Claims 1, 3, 19, 20, 22, 23, 25, 29, 31, 33, 35 are objected to because of the following informalities: these claims use the symbol “ \exists ” throughout their recitations (for example, “ $n_{\text{core}} > n_{\text{rods}} \exists n_{\text{cladding}}$ ”). However, symbol “ \exists ” is not a widely accepted symbol for inequality. While the applicant may be his or her own lexicographer, it is strongly urged that a widely accepted form of inequality symbol “ \geq ” should be used instead. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 5, 10, 13, 14, 16-20, 22, 23, 25-36 are rejected under 35 U.S.C. 102(e) as being anticipated by Cotteverte et al (US 6,542,682 B2).

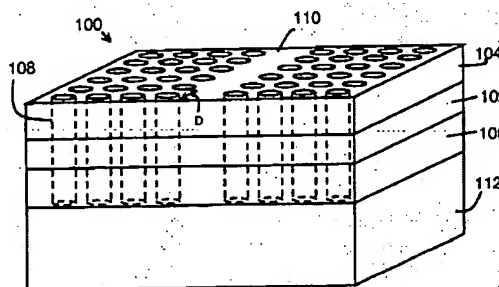


Fig. 14

Cotteverte discloses an optical device with all the limitations set forth in the claims, including: a core layer having a first refractive index n_{core} ('102' Fig. 14); an array of sub-regions within the core having a second refractive index n_{rods} ('108' Fig. 14); the array of sub-regions giving rise to a photonic band structure experienced by an optical mode traveling through the waveguide structure (column 1 lines 18-33); and a cladding layer adjacent to the core layer having a refractive index n_{cladding} ('104' Fig. 14); wherein: $n_{\text{core}} > n_{\text{rods}} \geq n_{\text{cladding}}$ and $n_{\text{core}} - n_{\text{rods}} > 0.1$ (column 8 lines 1-8, column 8 lines 29-37, column 8 lines 41-44, column 8 lines 55-56: one example in which the condition $n_{\text{core}} > n_{\text{rods}} \geq n_{\text{cladding}}$ and $n_{\text{core}} - n_{\text{rods}} > 0.1$ is satisfied is when sub-region is filled with air (refractive index of 1), and both cladding and buffer layers are air, as disclosed in column 8 lines 55-56); wherein the array of sub-regions gives rise to a photonic bandgap (column 1 lines 18-33); wherein the waveguide structure is a planar waveguide structure (Fig. 14); further including a buffer layer ('106' Fig. 14); having a refractive index n_{buffer} , wherein the core core layer is positioned between the buffer layer and the cladding layer wherein $n_{\text{core}} > n_{\text{rods}} \geq n_{\text{buffer}}$ (column 8 lines 1-8, column 8 lines 29-37, column 8 lines 41-44; column 8 lines 55-56); wherein the core layer is formed from doped silica (column 8 lines 31-32); wherein the core layer may also be silicon, which has refractive index between 1.4 and 4 (column 8 lines 31-32: silicon *inherently* has refractive index values around 3.5. see "Refractive index of Silicon" by Primak); wherein the sub-regions extend through the cladding layer (Fig. 14); wherein the sub-regions extend fully into the buffer layer (Fig. 14); wherein the core layer includes a lateral waveguiding region having no sub-regions ('110' Fig. 14); wherein the waveguiding region includes a waveguide bend (Fig. 18).

Also, Cotteverte teaches a method of manufacturing an optical waveguide comprising the steps of providing above discussed structures (column 8 lines 48-52).

In addition, since Cotteverte discloses all the structures of the claimed device, it inherently discloses a method of guiding an optical signal through such a device (abstract).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 4, 21, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cotteverte et al (US 6,542,682 B2) in view of Koops et al (US 6,075,915).

Cotteverte discloses an optical device as discussed above.

However, Cotteverte does not teach that the waveguide structure is an optical fiber with cladding layer surrounding the core layer.

Koops, on the other hand, teaches a photonic crystal waveguide structured formed as an optical fiber having a cladding layer surrounding the core layer (Fig. 2). This arrangement is advantageous and desirable over the prior art, because it allows for production of small and compact photonic bandgap device that is fully integrated with the optical signal transmission fiber. Thus, this arrangement obviates the need for complicated and costly coupling configuration between a photonic bandgap device and a transmission fiber.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the Cotteverte device to have the waveguide structured formed as a fiber.

Claims 7, 8, 11, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cotteverte et al (US 6,542,682 B2) in view of Yamada (US 6,631,236 B2).

Cotteverte discloses an optical device as discussed above. Also, Cotteverte teaches that various materials can be used for the sub-regions, the core, the cladding, and the buffer layers as long as the relationship among the refractive indexes of these layers are properly arranged (column 8 lines 1-8, column 8 lines 29-37, column 8 lines 41-44, column 8 lines 55-56).

However, Cotteverte does not teach the use of silicon dioxide cladding layer or buffer layer.

Yamada discloses the use of silicon dioxide cladding layers, which has refractive index of about 1.5, in photonic crystal waveguide device (Figs. 1-2, column 1 lines 53-55, column 8 lines 11-13).

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The use of silicon dioxide cladding and buffer layers is advantageous and desirable in the art because silicon dioxide can be produced with well known production methods at low cost, while providing a stable refractive index profile under varieties of operating conditions (such as high heat, etc.), and thus it efficiently confines the transmitted optical beam within the waveguiding portion of the device.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the device of Cotteverte to have silicon dioxide cladding and buffer layers.

Claims 6, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cotteverte et al (US 6,542,682 B2) in view of Reichert et al (US 5,961,924).

Cotteverte discloses an optical device as discussed above.

However, Cotteverte does not teach the use of silicon oxynitride, which has refractive index above 1.5, in the sub-regions.

Reichert, on the other hand, teaches the use of silicon oxynitride on a portion of the optical waveguide (column 4 line 63- column 5 line 6).

The use of oxynitride in waveguide portions is advantageous and desirable because silicon oxynitride is mechanically durable while providing desirable optical characteristics such as desired transmissivity and refractive index values. Thus, replacing the sub-regions of Cotteverte with silicon oxynitride would advantageously yield mechanically durable optical device while maintaining desired optical transmission characteristics.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the Cotteverte device to have silicon oxynitride in the sub-regions of the waveguide device.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cotteverte et al (US 6,542,682 B2) in view of Yamada (US 6,631,236 B2) as applied to claims above, and further in view of Reichert et al (US 5,961,924).

Cotteverte and Yamada render the claimed limitations obvious as discussed above.

However, they do not explicitly mention having sub-regions with refractive index greater than or equal to the refractive index of the cladding, but less than or equal to the refractive index of the sub-regions in the core.

Reichert, on the other hand, teaches the use of silicon oxynitride on a portion of the optical waveguide (column 4 line 63- column 5 line 6).

The use of oxynitride in waveguide portions is advantageous and desirable because silicon oxynitride is mechanically durable while providing desirable optical characteristics such as desired transmissivity and refractive index values. Thus, replacing the sub-regions of Cotteverte with silicon oxynitride would advantageously yield mechanically durable optical device while maintaining desired optical transmission characteristics.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the Cotteverte device to have silicon oxynitride in the sub-regions of the waveguide device, which would result in a sub-region in a cladding layer that has

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refractive index greater than the cladding layer, but has equal refractive index as the sub-region in the core layer (Fig. 14 of Cotteverte).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sung H. Pak whose telephone number is (571) 272-2353. The examiner can normally be reached on Monday- Friday, 9AM-5PM.

The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sung H. Pak
Examiner
Art Unit 2874

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